REMARKS

In the Office Action, dated April 30, 2008, the Examiner states that Claims 11-20 and 23-28 are pending and rejected. By the present Amendment, Applicant amends the claims.

Claims 11-20 and 23-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gibbons (US 2003/0232930) in view of Yamazaki (US 2003/0058210). Applicant respectfully disagrees with and traverses this rejection.

As a background, when the ferroelectric liquid crystal undergoing phase transition via no SmA phase is used for a liquid crystal display, two domains different in their layer normal-line directions, i.e. "double domain" is generated. The double domain has a problem whereby a display is produced where black and white are reversed.

As a method to remove the double domain, an "electric field induced technique" wherein a liquid crystal cell is heated to a temperature not lower than the Ch phase and subsequently cooled slowly while applying a DC voltage thereto is known in the art. This technique, however, has problems such that the alignment of the liquid crystal is disturbed when the temperature thereof is raised again to a temperature not lower than the phase transition temperature and that the alignment is disturbed in regions where no electric field acts between pixel electrodes.

Although the electric field induced technique has the above-mentioned problems, there was no alternative practical means to resolve double domain issues other than the electric field induced technique prior to the filing of the present application.

In a preferred embodiment, the present invention aims to provide a means to resolve the double domain issues without using the electric field induced technique. In other words, a preferred embodiment of the present invention aims to provide liquid crystal displays which can give mono-domain alignment and which are excellent in alignment stability so that the alignment thereof can be maintained even if the temperature of the liquid crystal is raised to the phase transition point or higher.

In a preferred embodiment of the present invention, a photo alignment film is provided on each of opposite faces of upper and lower substrates and the photo

alignment films are made of materials that are different from each other. Thereby, generation of alignment defects such as double domain is restricted and mono-domain alignment of the ferroelectric liquid crystal is obtained. Further, since the present invention can align the ferroelectric liquid crystal without using the electric field induced technique, the problems with this technique, such as alignment disturbance caused by the rising in temperature to the phase transition point or higher, are not found in the present invention.

To further clarify that having photo alignment films with materials different in composition enables the present invention to obtain a mono-domain alignment, Claim 11 is amended to specify that the ferroelectric liquid crystal forms mono-domain alignment in the liquid crystal layer.

With respect to the cited prior art, Yamakazi teaches an electric field induced technique to align the ferroelectric liquid crystal which does not have a SmA phase in a phase series. Accordingly, Applicant respectfully asserts that Yamakazi does not teach or suggest the features of the present invention.

Both of Yamakazi and Gibbons are completely silent regarding the feature of providing a liquid crystal display that resolves double domain issues unique to the ferroelectric liquid crystal having no SmA phase in a phase series and which can give mono-domain alignment. Moreover, these references are completely silent with respect to the feature of providing a liquid crystal display which can give mono-domain alignment while resolving double domain issues without using the electric field induced technique when a ferroelectric liquid crystal having no SmA phase in a phase series is used.

Features of the rejected claims are directed to resolving double domain issues unique to the ferroelectric liquid crystal having no SmA phase in a phase series and to obtain mono-domain alignment by sandwiching the ferroelectric liquid crystal between the photo alignment layers having different compositions in their respective materials.

Gibbons is completely silent regarding the ferroelectric liquid crystal having no SmA phase series. The characteristics of liquid crystals are totally different between a ferroelectric liquid crystal having no SmA phase in a phase series and a ferroelectric liquid crystal having a SmA phase in a phase series. Two domains different in their

layer normal-line directions (double domain) do not occur with the ferroelectric liquid crystal having a SmA phase in a phase series because the ferroelectric liquid crystal passes through the SmA phase during its alignment process.

Applicant respectfully asserts that the present invention is not achieved by simply combining the photo alignment layer of Gibbons and the ferroelectric liquid crystal having no SmA phase in a phase series recited in Yamazaki.

As previously mentioned, before the filing of the present application, there was no alternative practical means to resolve double domain issues other than the electric field induced technique prior to the filing of the present application. Applicant respectfully asserts that absolutely nothing in the prior art would suggest or motivate one of ordinary skill in the art to combine a reference having photo alignment layers made of different materials and a SmA phase with a reference that discloses a liquid crystal with no SmA phase in its series to solve the double domain issues. There was absolutely no teaching found in the prior art that such a combination would have any effect whatsoever on the double domain issue.

Moreover, Applicant respectfully asserts that one of ordinary skill in the art would have absolutely no expectation of success in combining a reference disclosing photoalignment layers made of different materials with a ferroelectric crystal with no smectic A phase in its phase series, to solve the double domain problem. As those of ordinary skill in the art are aware, the characteristics of liquid crystals are totally different between a ferroelectric liquid crystal having no SmA phase in a phase series and a ferroelectric liquid crystal having a SmA phase in a phase series. Armed with this information, not only would one of ordinary skill be dissuaded from removing a SmA phase from a ferroelectric liquid crystal that was designed to include the phase, one of ordinary skill in the art would have absolutely no expectation that the resultant would be successful in solving the double domain problem. With the prior art silent with respect to these embodiments of the present invention, Applicant reiterates that there was no teaching, suggestion or motivation to combine the references, nor would there have been any expectation of success in combining the references in an attempt to solve the double domain problem.

In light of the foregoing response, all the outstanding objections and rejections are considered overcome. Applicant respectfully submits that this application should now be in condition for allowance and respectfully requests favorable consideration.

Respectfully submitted,

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